The invention claimed is:

1. A method for spectrophotometric in vivo monitoring and display of blood metabolites in a plurality of different internal regions of the same test subject on a substantially simultaneous basis, comprising the steps of:

applying a plurality of spectrophotometric sensors to a test subject at each of a corresponding plurality of testing sites and coupling each such sensor to a control and processing station;

operating a selected number of said sensors to spectrophotometrically irradiate at least two internal regions of the test subject during a common time interval, each such region being associated with a different such testing site;

separately detecting and receiving the light energy resulting from said spectrophotometric irradiation for each of said two different regions, and conveying separate signals to said control and processing station which correspond to the separately detected light energy;

analyzing said conveyed signals to separately determine quantified data representative of the same blood metabolite in each of said at least two internal regions; and

visually displaying said quantified data for each of said at least two different regions for direct mutual comparison.

2. The method of claim 1, wherein said step of analyzing comprises determination of blood oxygenation level within each of said at least two regions.

3. The method of claim 2, wherein said analyzing step includes producing a separate quantitative value determination for hemoglobin oxygen saturation for each of said at least two different regions.

4. The method of claim 3, wherein said analyzing determination includes production of an ongoing graphical trace representing a plurality of said quantitative value designations made at successive points in time.

7 5. The method of claim 3 including the step of visually displaying a plurality of said quantitative value designations at substantially the same time and in predetermined relationship to one another to facilitate rapid and accurate visual comparison.

5 5 6. The method of claim 4 including the step of visually displaying a plurality of said graphical traces at substantially the same time and in predetermined relationship to one another to facilitate rapid and accurate visual comparison.

6 7. The method of claim 6 including the step of visually displaying a plurality of said quantitative value designations as well as said graphical traces at substantially the same time and in predetermined relationship to one another to facilitate rapid and accurate visual comparison.

8. The method of claim 1, including the step of providing signals to said control and processing station which comprise at least two data sets that cooperatively define blood metabolite data for a particular area within an individual one of said regions.

9. The method of claim 1, wherein said sensors are applied to the head of the test subject and used to monitor the brain.

8 10. The method of claim 9, wherein said metabolite comprises hemoglobin oxygen.

11. The method of claim 9, wherein said sensors are positioned in locations proximate to different brain hemispheres and said two internal regions are each located in a different such brain hemisphere.

10 9 12. The method of claim 11, wherein said metabolite comprises cerebral blood hemoglobin oxygenation.

13. The method of claim 11, including the step of providing signals to said control and processing station which comprise at least two data sets which cooperatively define blood metabolite data for an individual area within at least one of said particular regions.

14. The method of claim 8, wherein said provided data sets include one such set which characterizes a first zone within one of said regions and another such set which characterizes a second zone that is at least partially within the same said region.

15. The method of claim 14, wherein said second zone characterized by said other such data set includes at least part of said first zone.

16. The method of claim 1, wherein said sensors are applied to the outside periphery of the test subject and operate non-invasively.

17. Apparatus for spectrophotometric in vivo monitoring of blood metabolites in each of a plurality of different internal regions on a substantially concurrent basis, comprising:

a plurality of spectrophotometric sensors, each attachable to a test subject at a different test location and adapted to spectrophotometrically irradiate a given region within the test subject associated with each such test location;

a controller and processor, and circuitry coupling each such sensor to said controller and processor for individually operating certain of said sensors to spectrophotometrically irradiate said given internal region within the test subject associated with each such test location;

said sensors each further adapted to receive light energy resulting from the spectrophotometric irradiation by that sensor of its associated region on a substantially concurrent basis with other such sensors, and to produce separate signals corresponding to the light energy so received; and said circuitry acting to convey said separate signals to said controller and processor for separate analytic processing;

said controller and processor adapted to analytically process said conveyed signals separately and thereby determine separate quantified blood metabolite data therefrom for separate such sensors; and

a visual display coupled to said controller and processor and adapted to separately display the quantified metabolite data so determined for each of a plurality of sensors in a mutually-comparative manner.

18. The apparatus of claim 17, wherein said controller and processor is adapted to analyze said data to determine blood oxygenation within at least two separate internal regions.

19. The apparatus of claim 18, wherein said controller and processor is adapted to produce numeric value designations for hemoglobin oxygen saturation for at least two of said regions.

20. The apparatus of claim 19, wherein said controller and processor and said display are adapted to produce an ongoing graphical trace representing a plurality of said numeric value designations for the same region taken over a period of time.

21. The apparatus of claim 19 wherein said controller and processor and said display are adapted to visually display at least two of said numeric value designations on a substantially concurrent basis and in predetermined relationship to one another to facilitate rapid and accurate visual comparison.

22. The apparatus of claim 20 wherein said controller and processor and said display are adapted to visually display at least two of said graphical traces on a substantially concurrent basis and in predetermined relationship to one another to facilitate rapid and accurate visual comparison.

23. The apparatus of claim 22 wherein said controller and processor and said display are adapted to visually display at least two of said numeric value designations as well as at least two of said graphical traces on a substantially concurrent basis and in proximity to one another to facilitate rapid and accurate visual comparison.

24. The apparatus of claim 17, wherein said sensors are adapted to provide signals to said controller and processor which comprise at least two separate data sets that cooperatively define at least portions of a particular area within a given such region.

25. The apparatus of claim 17, wherein said sensors are adapted to be applied to the head of a test subject and to monitor its brain.

26. The apparatus of claim 25, wherein said computer is adapted to determine blood oxygenation saturation in said brain.

27. The apparatus of claim 25, wherein said sensors are adapted to be positioned in locations associated with different hemispheres of the same brain and are operable to separately monitor at least portions of each such different hemisphere.

28. The apparatus of claim 27, wherein said controller and processor is adapted to determine cerebral blood oxygenation saturation within said two different brain hemispheres.

29. The apparatus of claim 27, wherein said sensors are adapted to provide signals to said controller and processor which comprise at least two data sets that cooperatively define at least portions of a particular area within the same such internal regions.

30. The apparatus of claim 24, wherein said data sets provided by said sensors include one such set characterizing a first zone adjacent said given region and another such set characterizing a second zone at least partially within said given region.

31. The apparatus of claim 30, wherein said second zone characterized by said other such data set includes at least part of said first zone.

32. The apparatus of claim 17, wherein said sensors are adapted to be applied to the outside periphery of the test subject and to operate non-invasively.

33. A method for substantially simultaneous comparative in vivo monitoring of blood metabolites in each of a plurality of different internal regions of at least one selected test subject, comprising the steps of:

spectrophotometrically irradiating each of a plurality of different testing sites on said at least one test subject;

detecting light energy resulting from said spectrophotometric irradiation for a plurality of such testing sites, and providing signals to a control and processing station which are representative of the light energy so received for said plurality of testing sites;

analyzing said conveyed signals to determine quantified blood metabolite data representative of at least one defined region within said at least one test subject associated with each of at least two different such testing sites, each such defined region being different from the other; and

displaying said data for each of said at least two different regions at substantially the same time for direct mutual comparison.

34. The method of claim 33, wherein the step of providing signals to said control and processing station comprises providing at least two data sets that cooperatively define blood metabolite data for an individual one of said defined regions.

35. The method of claim 34, wherein said provided data sets include one such set which characterizes a first zone proximate to said defined region and another such set which characterizes a second zone that is at least partially within said defined region.

36. The method of claim 35, wherein said second zone characterized by said other such data set includes at least part of said first zone.

37. The method of claim 33, wherein said step of spectrophotometrically irradiating is carried out by using a plurality of sensors applied to the outside periphery of the test subject and operated non-invasively.

38. The method of claim 33, wherein said control and processing station is used to time and sequence emission of spectrophotometric radiation and detection of resulting light energy by said sensors.

39. The method of claim 33, wherein said spectrophotometric irradiation by said sensors is done sequentially and alternatively.

40. The method of claim 33, wherein said spectrophotometric irradiation comprises application of at least two different wavelengths, and such wavelengths are applied in an alternating sequence of timed pulses.

41. The method of claim 40, including detection of the resulting light energy corresponding to each of said wavelengths on a timed periodic basis using periods whose occurrence generally corresponds to that of said applied spectrophotometric wavelength pulses.

42. The method of claim 41, wherein the duration of each of said timed detection periods is limited to a length which is less than that of each pulse of applied spectrophotometric irradiation energy.

43. The method of claim 42, wherein the duration of each of said detection periods is less than half that of a pulse of said applied spectrophotometric irradiation.

44. The method of claim 43, wherein a plurality of said detection periods are used during pulses of said applied irradiation, and a corresponding energy detection occurs during each of a plurality of said detection periods.

45. The method of claim 44, further including the steps of averaging a selected number of energy detection event values to obtain a resultant value therefor, and using said resultant value to compute a metabolite value which is representative thereof.

46. The method of claim 45, wherein said display includes said computed representative metabolite value.

47. The method of claim 46, wherein said display is refreshed periodically by using a sequence of computed representative metabolite values which are based upon and represent the averaged detection event values produced during the different time intervals corresponding to the intervals of said periodic display refreshment.

48. Apparatus for spectrophotometric in vivo monitoring of a selected metabolic condition in each of a plurality of different test subject regions on a substantially concurrent basis, comprising:

a plurality of spectrophotometric emitters, each adapted to spectrophotometrically irradiate a designated region within a test subject from a test location on such test subject;

a controller and processor, and circuitry coupling each such emitter to said controller and processor for individually operating selected such emitters to spectrophotometrically irradiate at least two regions within a test subject from at least one selected test location;

a plurality of detectors adapted to receive light energy resulting from the spectrophotometric irradiation of said at least two regions, and to produce at least one separate set of corresponding signals for each such region; and circuitry acting to convey said separate sets of signals to said controller and processor for analytic processing;

said controller and processor adapted to analytically process said conveyed sets of signals to determine separate sets of quantified data representative of said metabolic condition in said at least two regions; and

a visual display coupled to said controller and processor and adapted to display separate representations of said separate sets of quantified metabolic data for said at least two regions in a mutually-comparative manner and on a substantially simultaneous basis.

49. The apparatus of claim 48, wherein said controller and processor includes a computer programmed to analyze said detector signals to determine the blood oxygenation state within each of said at least two regions.

50. The apparatus of claim 49, wherein said computer comprises a processor, data buffers, and a timing signal generator, said data buffers adapted to store data representative of said blood oxygenation state and said timing signal generator adapted to control actuation of said emitters and detectors accordingly.

51. The apparatus of claim 49, wherein said controller and processor comprises a unitary device which includes said computer and said display.

52. The apparatus of claim 51 wherein said unitary controller and processor device further includes a keyboard interface to said computer.

53. The apparatus of claim 51 wherein said unitary controller and processor device further includes a data output interface.

54. The apparatus of claim 53 wherein said unitary controller and processor device further includes an integral keyboard interface to said computer.

55. The apparatus of claim 51, wherein said display comprises a flat electroluminescent visual display screen.

56. The apparatus of claim 55 wherein said unitary controller and processor unit further includes an integral keyboard interface to said computer.

57. The apparatus of claim 48, wherein at least certain of said detectors and certain of said emitters comprise operational pairs, and said controller and processor is arranged to operate the emitters and detectors of at least certain of such pairs in predetermined timed relationship while maintaining the emitters and detectors of other such pairs in a non-operating condition.

58. The apparatus of claim 57, wherein said controller and processor is adapted to sequence the operation of certain of such emitter-detector pairs.

59. The apparatus of claim 57, wherein at least certain of said operational emitter detector pairs include at least two detectors and at least one such detector is located nearer the emitter of such pair than at least one of the other detectors to provide near and far detector groupings for that operational pair.

60. The apparatus of claim 58, wherein at least certain of said operational pairs include a plurality of said detectors arranged at mutually spaced locations which are spaced at differing distances from the emitter of their operational pair.

61. The apparatus of claim 59, wherein said controller and processor is adapted to sequence the operation of certain of such emitter-detector pairs.

62. The apparatus of claim 60, wherein said controller and processor is adapted to operate the emitter and a selected number less than all of the detectors of at least one of said at least certain of said operational pairs substantially in unison while holding the other detectors of said at least one operational pair in non-operating condition, and said controller and processor is further arranged to operate such other detectors substantially in unison with said emitter at another time during which said selected number of detectors are maintained in a non-operating condition.